

A Synopsis of the Genus *Actinodaphne* Nees (Lauraceae) in Sabah and Sarawak, Malaysia

S. JULIA

Forest Research Centre
KM10, Jalan Datuk Amar Kalong Ningkan,
93250 Kuching, Sarawak, Malaysia

Abstract

In Sabah and Sarawak, a total of 20 species of *Actinodaphne* are recognized including one imperfectly known species. Of these, eight (*Actinodaphne kostermansii* S. Julia, *Actinodaphne percoriacea* S. Julia, *Actinodaphne robusta* S. Julia, *Actinodaphne semengohensis* S. Julia, *Actinodaphne soepadmoi* S. Julia, *Actinodaphne spathulifolia* S. Julia, *Actinodaphne sulcata* S. Julia and *Actinodaphne venosa* S. Julia) are new to science. In addition, two varieties, *Actinodaphne kostermansii* var. *glabrescens* S. Julia and *Actinodaphne sulcata* var. *longipetiolata* S. Julia are also described as new. Relevant references, basionyms, type specimens (if known), synonyms, distribution, ecology and notes for each species occurring in Sabah and Sarawak are provided. An identification list for all specimens examined is given.

Introduction

The genus *Actinodaphne* Nees was established by C. G. Nees von Esenbeck in 1831 based on *A. pruinosa* Nees from Peninsular Malaysia. Since then, a total of 150 binomials have been published by various authors (IPNI, 2005). Of these, 14 binomials were attributed to species from Borneo of which 11 occur in Sabah and Sarawak (Blume, 1851; Miquel, 1858; Merrill, 1921, 1929; Masamune, 1942; Burgess, 1966; Anderson, 1980; Kochummen, 1989; Coode *et al.*, 1996; Argent *et al.*, 1997; and Beaman *et al.*, 2001).

The present study, based mainly on available specimens collected from Borneo and preserved at the BO, KEP, PNH, Kinabalu Park, SAN, SAR and SING herbaria and supplemented with images of type specimens from the data bases/websites of the National Herbarium of the Netherlands, University of Leiden Branch (L), New York Botanic Garden (NY) and Royal Botanic Gardens, Kew (K) resulted in 20 species (including one incompletely known species) being recognized. Of these, eight are new to science and one is a new record for Borneo (*A. johorensis* Gamble). Of the eight new species, four (*A. percoriacea*, *A. semengohensis*, *A. spathulifolia* and *A. sulcata*) are endemic in Sabah and Sarawak, two in Borneo (also occurring in Brunei and/or Kalimantan; *A. kostermansii* and *A. venosa*) and two also occur outside Borneo (*A. robusta*, Peninsular Malaysia and the Philippines and *A. soepadmoi*, Peninsular Malaysia).

The genus *Actinodaphne* comprises about 100 recognized species (Kostermans, 1957; Rohwer, 1993; van der Werff, 2001), distributed from India and Sri Lanka to Myanmar, Thailand, Indo-China, China, Korea, Japan, Malesia and the Solomon Islands.

In Borneo, species of *Actinodaphne* occur in various forest types on different soils, including mixed dipterocarp forest, peat swamp forest, *kerangas* forest, riparian forest and forest on limestone and ultrabasic soils, at altitudes from sea level to 2400 m.

Actinodaphne Nees

Actinodaphne Nees in Wallich, Pl. As. Rar. 2 (1831) 61, 68; Gamble, J. As. Soc. Beng. 75, 1 (1912) 112; Merrill, J. Str. Br. Roy. As. Soc., Special Number (1921) 274, Univ. Calif. Publ. Bot. 15 (1929) 78; Ridley, Fl. Malay Penins. 3 (1924) 107; Masamune, En. Phan. Born. (1942) 306; Kostermans, Comm. For. Res. Inst. Bogor (1957) 42; Backer & Bakhuizen f., Fl. Java 1 (1964) 124; Burgess, Sabah For. Record 6 (1966) 330; Anderson, Checkl. Trees Sarawak (1980) 220; Corner, Wayside Trees of Malaya 3rd edition, 1 (1988) 382; Kochummen, Tree Fl. Malaya 4 (1989) 102; Rohwer in Kubitzki *et al.* (eds.), Fam. Gen. Vas. Pl. 2 (1994) 366; Turner, Gard. Bull. Sing. 47 (1995) 273; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 1 (1997) 301; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 393; van der Werff, Blumea 46 (2001) 125.

Type species: Actinodaphne pruinosa Nees.

Terminal (vegetative) buds *perulate*; scales imbricate, often leaf-like, on falling leaving distinct scars just above the whorls of leaves. **Leaves** pinnately veined, usually in whorls of 3–9 or rarely not strictly in whorls; upper surface plane or bullate, often shining, lower surface often glaucous; lateral veins disappearing towards the margin or occasionally joining near the margin at the upper half of the leaf blade; tertiary veins scalariform, subscalariform or reticulate. **Inflorescences** axillary or extra-axillary, usually condensed umbels, pseudo-umbels or glomerules (or the males rarely racemes as in *A. johorensis* Gamble and *A. semengohensis*, or panicles as in *A. montana* Gamble) of sessile or pedicelled flowers borne on short lateral shoots with or without terminal vegetative buds, surrounded by sessile involucrel, imbricate bracts which on falling leave distinct scars at the base of the inflorescence. **Flowers** trimerous, unisexual; perianth lobes 6, outer lobes slightly larger than the inner ones; *fertile stamens* in male flowers and staminodes in female flowers usually 9, arranged in 3 whorls, those of the first and second whorls non-glandular, that of the third whorl

with stalked glands on each side at the base; *filaments* longer or shorter than anthers, *anthers* 4-locular, the *locules* all introse, arranged in two pairs above each others; *pistillode* in male flower rudimentary and minute or absent; ovary in female flowers superior, narrowed towards the style, stigma peltate, dilated or discoid. **Infructescences** each bearing 1–18 fruits. **Fruits** drupaceous, seated on a flat or shallowly saucer-shaped or deeply cup-shaped, accrescent or non-accrescent cupule with or without a remnant of perianth lobes.

Enumeration of Species Occurring in Sabah and Sarawak

1. *Actinodaphne borneensis* Meisn.

Actinodaphne borneensis Meisn. in A.DC., Prodr. 15, 1 (1864) 213; Merrill, J. Str. Br. Roy. As. Soc., Special Number (1921) 274; Masamune, En. Phan. Born. (1942) 306; Burgess, Sabah For. Record 6 (1966) 330; Anderson, Checkl. Trees Sarawak (1980) 220; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149. **Type**: *Lobb s.n.*, Borneo (*holo n.v.*; *iso* K [K000009921]).

Distribution: Endemic in Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In mixed dipterocarp, beach, peat swamp, *kerangas* and submontane forests (including forest on ultrabasic soil) at altitudes from sea level to 1500 m.

Notes: A widespread species in Borneo, characterized by its well-spaced lateral veins of 3–7 pairs, tertiary veins obscure on both surfaces or obscure above, prominulous below, pseudo-umbellate inflorescences each bearing up to 7 flowers, and fruit, which is seated on a shallowly saucer-shaped or deep cup-shaped cupule. The leaves are highly variable in size, ranging from 3.5 x 2 cm to 25 x 8.5 cm.

The species resembles *Actinodaphne pruinosa* Nees and *A. oleifolia* Gamble but can be differentiated from the former by its lax or well-spaced (vs. dense) lateral veins and from the latter by its scalariform (vs. pitted or reticulate) and obscure or prominulous tertiary veins underneath (vs. distinctly prominent).

Kochummen (1989) described specimens from Peninsular Malaysia (*Corner SFN 21345*, *Kiah SFN 32386* and *FRI 13451*) as *A. borneensis*. However, after re-examining the specimens and comparing them with that of the type as well as other specimens of *A. borneensis* collected from Borneo, I am of the opinion that the three specimens from Peninsular

Malaysia belong to *A. malaccensis* Hook.f., which does not occur in Sabah and Sarawak.

2. *Actinodaphne diversifolia* Merr.

Actinodaphne diversifolia Merr., J. Str. Br. Roy. As. Soc. 85 (1922) 191; Masamune, En. Phan. Born. (1942) 306; Burgess, Sabah For. Record 6 (1966) 330; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 393. **Type:** *Ramos* 1838, Borneo, Sabah, Sandakan District, Sebuga (*holo* K; *iso*, *n.v.*: A, BO).

Distribution: Endemic in Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In beach, peat swamp, *kerangas*, mixed dipterocarp and submontane forests at altitudes to 1200 m.

Notes: Common and widespread in Sabah and well represented in Gunung Kinabalu National Park, Crocker Range National Park and Maliau Basin Conservation Area but it is very rare in Sarawak. Its narrowly elliptic leaves that are hairy on the lower surface readily distinguish the species.

The species resembles *Actinodaphne kostermansii* var. *kostermansii* but can be differentiated by its linear (vs. lanceolate) bud-scales, narrow elliptic, unequal-sided leaves (vs. broadly elliptic; equal-sided) with sharply acute (vs. rounded or broadly acute) base, slightly revolute (vs. strongly revolute) margins, and closely scalariform (vs. distantly scalariform) tertiary veins.

3. *Actinodaphne fuliginosa* Airy Shaw

Actinodaphne fuliginosa Airy Shaw, Bull. Misc. Inform., Kew (1939) 535; Masamune, En. Phan. Born. (1942) 306. **Type:** *Synge* 1893, Borneo, Sarawak, Dulit Range (*holo* K; *iso* SING).

Distribution: Endemic in Borneo (Sarawak). Very rare and known only from the type specimen from Dulit Range in Sarawak.

Ecology: In open mossy forest on exposed peak at c. 1400 m altitude.

Notes: This distinctive species is characterized by its small, 2.5–4.5 x 1.5–2.5 cm, obovate leaves with a rounded apex.

4. *Actinodaphne glabra* Blume

Actinodaphne glabra Blume, Mus. Bot. Lugd-Bat. I (1851) 344; Backer & Bakhuizen f., Fl. Java 1 (1964) 125; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 393. **Type:** *Blume s.n.*, Java (*lecto* L [NHN-L Acc. No. 905220121], designated here).

Distribution: Peninsular Malaysia, Java and Borneo (Brunei, Kalimantan, Sabah, Sarawak).

Ecology: In mixed dipterocarp and riparian forests on alluvial and ultrabasic soils at altitudes to 600 m.

Notes: The species is characterized by its long and narrowly elliptic or oblanceolate leaves with long acuminate or pointed leaf apex. In Borneo, however, there are specimens with rounded, obtuse or shortly acuminate leaf apex (e.g. *S* 8151, *SAN* 25354, *SAN* 37438, *SAN* 55839 and *SAN* 132242). Images of type specimens of two other species (*Actinodaphne pubescens* Blume from Java and *A. rumphii* Blume from the Moluccas) strongly suggest that these two species may be conspecific with *A. glabra*. More specimens from the relevant areas for detailed study are, however, needed to elucidate the taxonomic status of the two taxa.

5. *Actinodaphne glomerata* (Blume) Nees

Actinodaphne glomerata (Blume) Nees, Syst. Laur. (1836) 597; Blume, Mus. Bot. Ludg.- Bat. 1 (1851) 343; Miquel, Fl. Ind. Bat. 1 (1858) 968; Gamble, J. As. Soc. Beng. 75, 1 (1912) 116; Ridley, Fl. Malay Penins. 3 (1924) 108; Backer & Bakhuizen f., Fl. Java 1 (1964) 124; Burgess, Sabah For. Record 6 (1966) 330; Anderson, Checkl. Trees Sarawak (1980) 220; Corner, Wayside Trees of Malaya 3rd edition, 1 (1988) 220; Kochummen, Tree Fl. Malaya 4 (1989) 104; Turner, Gard. Bull. Sing. 47 (1995) 273; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 1 (1997) 303; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 393. — *Litsea glomerata* Blume, Bijdr. Fl. Ned. Ind. (1826) 566. **Type:** *Blume s.n.*, W Java, Gunung Salak, (*holo n.v.*; *iso* NY [00355279]).

Syn. nov.: *Actinodaphne maingayi* Hook.f. var. *macrocarpa* Gamble, J. As. Soc. Beng. 75, 1 (1912) 115; *Actinodaphne sesquipedalis* Hook.f. & Thoms. var. *macrocarpa* (Gamble) Ridl., Fl. Malay Penins. 3 (1924) 108. **Type:** Ridley 11675, Borneo, Sarawak, Matang (*lecto* SING, designated here)

Distribution: Sumatra, Java, Peninsular Malaysia, Singapore, Borneo (Brunei, Kalimantan, Sabah and Sarawak) and Sulawesi.

Ecology: A very common and widespread species occurring in mixed dipterocarp, riparian and submontane forest at altitudes to 1500 m, on various soil types.

Notes: In Borneo, the leaves of this species are very variable in shape, ranging from obovate to broadly elliptic or suborbicular and in size from 11–41 cm long and 5–23 cm wide, with a length:width ratio of 2:1 to 1:1 depending on their position on the branch and the habitats where the trees grow. However, its thinly coriaceous leaves with a glaucous or brownish undersurface and many-flowered, condensed, glomerulate inflorescences easily distinguish the species. The specimen (*Mikil SAN 38734*) from Mount Kinabalu cited by Beaman *et al.* (2001) as *Actinodaphne sesquipedalis* Hook.f. & Thoms. belongs to *A. glomerata*.

6. *Actinodaphne johorensis* Gamble

Actinodaphne johorensis Gamble, Bull. Misc. Inform., Kew (1910) 313; Gamble, J. As. Soc. Beng. 75, 1 (1912) 117; Ridley, Fl. Malay Penins. 3 (1924) 109; Kochummen, Tree Fl. Malaya 4 (1989) 104; Turner, Gard. Bull. Sing. 47 (1995) 273. **Type:** Ridley 4419, Johor, Gunung Panti (*holo* SING; *iso* SING).

Distribution: Peninsular Malaysia and Borneo (Sarawak).

Ecology: Confined to *kerangas* forest at altitudes to 400 m.

Notes: The species was previously known as endemic in Peninsular Malaysia (Johor and SW Pahang). This is a new record for Borneo and is known only from the Kuching, Sri Aman and Lundu Districts, Sarawak.

Actinodaphne johorensis can easily be recognized by its thickly coriaceous, glabrous leaves (except on the midrib and lateral veins), usually glaucous underneath and slightly prominent lateral veins, almost obscure tertiary veins and racemose male inflorescence.

7. *Actinodaphne kinabaluensis* Kosterm.

Actinodaphne kinabaluensis Kosterm., Reinwardtia 7 (1969) 452; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 394. **Type:** Chew *et al.* RSNB 196, Borneo, Sabah, Gunung Kinabalu (*holo* BO; *iso* K, L, SING).

Distribution: Endemic in Borneo (Sabah); rare and known only from the type.

Ecology: Montane forest at 2400 m altitude.

Notes: Even though this species is known only from one fruiting specimen, it definitely belongs to *Actinodaphne* as shown by its vegetative and fruit characters that conform to those of the genus.

The species can easily be recognized by its thickly coriaceous, densely hairy, bullate leaves and ellipsoid fruits. It is the only *Actinodaphne* species in Sabah and Sarawak with ellipsoid fruit.

8. *Actinodaphne kostermansii* S. Julia, *sp. nov.*

(André Joseph Guillaume Henri Kostermans, 1906–1981, prominent botanist at the Herbarium Bogoriense)

Actinodaphne diversifoliae similis, perulis lanceolatis (vs. linearibus), foliis late (vs. anguste) ellipticis aequilateris (vs. inaequilateris), basi acuta ad late (vs. argute) acuta, apice acuto ad breviter acuminato (acumine, 0.5–1 cm vs. 1.5–2 cm longo), nervis tertiariis distantiter (vs. arte) scaliformibus differt. **Typus:** *Clemens* 50386, Borneo, Sabah, Kota Kinabalu District, Gunung Kinabalu, Penibukan (holo L).

Tree 6–20 m tall, 7–30 cm diam.; bole straight, *c.* 6 m tall; buttresses absent. **Bark** brownish green or dark grey, smooth; inner bark yellowish, fibrous. **Sapwood** yellowish. **Twigs** drying brown, glabrescent, smooth. **Terminal (vegetative) buds:** scales lanceolate, 10–30 x 4–8 mm, densely hairy. **Leaves** in whorls of 3–5, thickly coriaceous, glabrous or very sparsely hairy above, glabrous or densely hairy below, drying brown or greenish brown above, greyish or brownish below; blade broadly elliptic, (15.5–) 21–31(–39) x 7–15.5 cm, base broadly acute, margin strongly revolute, apex acute or acuminate, acumen 0.5–1 cm long; midrib raised on both surfaces, stronger below, glabrous or sparsely hairy above, glabrous or densely hairy below; lateral veins 7–11 pairs, lax, at an angle of *c.* 30° from the midrib, flat or sunken above, strongly raised below, joining towards margin at the upper half of leaf; tertiary venation slightly distinct or obscure above, distinct below, distantly scalariform; petiole 1.5–3.5 cm long, sparsely or densely hairy, drying black or dark brown. **Inflorescences** and **flowers** unknown. **Infructescences** each bearing 1–7 fruits (in glomerulate arrangement); vegetative terminal buds present. **Fruits** globose, 1.3–1.5 cm diam., drying black; cupule sometimes accrescent, deeply or shallowly saucer-shaped, 1–1.2 cm across, remnant of perianth lobes absent or present;

pedicels 5–7 mm long. **Seeds** globose, 0.8–1 cm diam., drying dark brown.

Distribution: Endemic in Borneo (confined to Brunei and Sabah).

Ecology: Uncommon in mixed dipterocarp, submontane, riparian forests and forest on ultrabasic soil at altitudes to 1400 m.

Notes: Even though inflorescences and flowers are not available, this species is placed in *Actinodaphne* based on its vegetative (e.g. perulate terminal bud, imbricate bud scales, pinnately veined leaves arranged in whorls of 3–5 and distinct bud-scale scars above the whorls of leaves) and fruiting characters.

The species is reminiscent of *A. diversifolia* but differs by its lanceolate (vs. linear) bud-scales, broadly elliptic, equal-sided leaves (vs. narrow elliptic, unequal-sided) with rounded or broadly acute (vs. sharply acute) base, strongly revolute (vs. slightly revolute) margins, and distantly scalariform (vs. closely scalariform) tertiary veins.

In 1977, Kostermans annotated specimen *Clemens 50386* as *A. clemensii*, a new species but he never validated the name of the new taxon. This new species is renamed in honour of Dr. A.J.G.H. Kostermans who made an enormous contribution toward the advancement of our knowledge on the Lauraceae of the Malesian region.

Beaman *et al.* (2001) incorrectly identified the same specimen (*Clemens 50386*) as *A. sesquipetalis* Hook.f. & Thoms., a species only known from Myanmar and Peninsular Malaysia and differing from *A. kostermansii* by its oblanceolate, obovate or elliptic-oblong (vs. broadly elliptic) leaves arranged in whorls of 5–13 (vs. in whorls of 3–5) with strongly prominent (vs. obscure or prominulous) tertiary veins.

In Sabah and Sarawak, two varieties are recognized, viz. var. *kostermansii* and var. *glabrescens*.

var. kostermansii

Distribution: Endemic in Borneo (Sabah and Brunei). Found in montane, riparian and mixed dipterocarp forests, at altitudes to 1400 m.

Notes: Leaves and midrib very sparsely hairy above, densely hairy below.

Other specimens examined: **BORNEO – BRUNEI**, Temburong District, Amo, Ulu Temburong, Coode *et al.* MC 7869 (KEP, SAR); **SABAH**, Ranau District, Sosopodon Forest Reserve, Aban SAN 64101 (SAN).

var. glabrescens S.Julia, **var. nov.**

(Latin, *glabrescens*=becoming glabrous; referring to the leaves)

A var. *typica* foliis glabris (vs. infra dense pubescentibus) differt. **Typus:** Proctor SAN 98112, Borneo, Sabah, Lahad Datu District, Gunung Silam (holo SAN).

Distribution: Endemic in Sabah and found in mixed dipterocarp forests and forest on ultrabasic soil, at altitudes to 800 m.

Notes: This new variety differs from var. *kostermansii* in having leaves that are glabrous (on both surfaces) or very sparsely hairy (particularly on the midrib and lateral veins below).

Other specimens examined: **BORNEO – SABAH**, Kota Belud District, Melangkap Tomis, *Lorence Lugas* 1922 (BO, KEP, KNP, SAN, SAR), Lahad Datu District, Gunung Silam, *Mujin* SAN 37821 (SAN), *Proctor* SAN 98060 (SAN), *Proctor* SAN 98118 (SAN), *Proctor* SAN 100721 (SAN), *Proctor* SAN 100729 (SAN), *Proctor* SAN 101957 (SAN), *Rimi et al.* SP 6276 (KNP), Ranau District, Kinabalu National Park, *Kokawa & Hotta* 5603 (SAN).

9. Actinodaphne macrophylla (Blume) Nees

Actinodaphne macrophylla (Blume) Nees, Syst. Laur. (1836) 598; Blume, Mus. Bot. Ludg.-Bat. 1 (1851) 341; Miquel, Fl. Ind. Bat. 1,1 (1858) 965; Backer & Bakhuizen f., Fl. Java 1 (1964) 125; Kochummen, Tree Fl. Malaya 4 (1989) 105; Turner, Gard. Bull. Sing. 47 (1995) 273; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149; Argent *et al.* (eds.), Man. Non-Dipt. Trees Centr. Kalimantan 1 (1997) 303. — *Litsea macrophylla* Blume, Bijdr. Fl. Ned. Ind. (1826) 567. **Type:** *Blume s.n.*, Java, Nusa Kambangan (*n.v.*).

Actinodaphne maingayi Hook.f., Fl. Brit. Ind. 5 (1886) 151; Gamble, J. As. Soc. Beng. 75, 1 (1912) 114; Merrill, J. Str. Br. Roy. As. Soc., Special Number (1921) 274; Ridley, Fl. Malay Penins. 3 (1924) 108; Masamune, En. Phan. Born. (1942) 306; Corner, Wayside Trees of Malaya 3rd edition, 1 (1988) 345. **Type:** *Maingay* 1258, Peninsular Malaysia, Malacca (*lecto* K, designated here; *iso* L).

Distribution: Peninsular Malaysia, Singapore, Java and Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In mixed dipterocarp, riparian, *kerangas* and swamp forests, at c. 890 m altitude.

Notes: The species is characterized by its thickly coriaceous, broadly elliptic-oblong or oblanceolate leaves, which are densely hairy underneath with very strongly prominent lateral veins and sturdy petiole. *Actinodaphne macrophylla* is very close to *A. sesquipedalis* from Myanmar and Peninsular Malaysia but can be differentiated by its very densely hairy (vs. glabrous) twig, leaves densely hairy underneath (vs. sparsely hairy or glabrous) with very distinctly prominent (vs. almost obscure or slightly prominent) tertiary veins.

10. *Actinodaphne myriantha* Merr.

Actinodaphne myriantha Merr., Univ. Calif. Publ. Bot. 15 (1929) 78; Masamune, En. Phan. Born. (1929) 306; Burgess, Sabah For. Record 6 (1966) 330; Anderson, Checkl. Trees Sarawak (1980) 220. **Type:** *Elmer 21335*, Borneo, Sabah, near Tawau (*holo* PNH †; *iso* BO, L, MO, SING).

Distribution: Endemic in Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In mixed dipterocarp, peat swamp, and riparian forests at altitudes to 700 m.

Notes: This species resembles *Actinodaphne glomerata* but differs by its narrowly obovate or narrowly elliptic (vs. broadly obovate or broadly elliptic), much longer and narrower leaves with a length:width ratio of 3:1 (vs. length:width ratio of 2:1 or 1:1).

11. *Actinodaphne oleifolia* Gamble

Actinodaphne oleifolia Gamble, Bull. Misc. Inform., Kew (1910) 313; Gamble, J. As. Soc. Beng. 75, 1 (1912) 121; Merrill, J. Str. Br. Roy. As. Soc., Special Number (1921) 274; Ridley, Fl. Malay Penins. 3 (1924) 111; Masamune, En. Phan. Born. (1942) 306; Burgess, Sabah For. Record 6 (1966) 330; Kochummen, Tree Fl. Malaya 4 (1989) 106; Turner, Gard. Bull. Sing. 47 (1995) 274; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149. **Type:** *Ridley 13728*, Peninsular Malaysia, Pahang, Gunung Berembun (*lecto* K, designated here; *iso* SING).

Actinodaphne gelonioides Ridl., Fl. Malay Penins. 3 (1924) 111. **Type:** *Robinson s.n.*, Peninsular Malaysia, Perak, Gunung Kerbau (*holo* K).

Syn. nov.: *Actinodaphne foxworthiana* Gibbs, J. Linn. Soc. Bot. 42 (1914)

129; Merrill, J. Str. Br. Roy. As. Soc., Special Number (1921) 274; Masamune, En. Phan. Born. (1942) 306; Burgess, Sabah For. Record 6 (1966) 330. **Type:** *Gibbs 3135*, Borneo, Sabah, Kota Belud District, Gunung Kinabalu, Paka Cave (*holo* BM; *iso* K).

Distribution: Peninsular Malaysia and Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In mixed dipterocarp, submontane to upper montane, limestone, *kerangas* and peat swamp forests and forest on ultrabasic soil at altitudes to 1800 m.

Notes: The species is rather similar to *Actinodaphne pruinosa* in its smallish leaves but it is distinct in having obtuse or shortly acuminate leaves, with an acumen 1–1.5 cm long (vs. with an acumen 1.5–3 cm long) and pitted or reticulate (vs. scalariform) tertiary veins that are distinctly prominent on both surfaces (vs. obscure or prominulous above, prominent below).

From the small-leaved *A. borneensis*, the species differs by its dense (vs. lax or well-spaced) lateral veins and reticulate (vs. scalariform) and distinctly prominent (vs. obscure or slightly prominent) tertiary veins.

Specimens that were previously recognized by Kochummen (1989) as *A. oleifolia* and/or *A. gelonoides* (*FRI 10111*, *Holtum SFN 20725*, *Megsay & Kiah SFN 31832*, *Mohd. Shah MS 1461*, *FMS 43076*, *Symington & Kiah SFN 28831*, *Seimund 341*) from Peninsular Malaysia may represent an undescribed new species differing from *A. oleifolia* by its almost rounded and broader thickly coriaceous leaves.

12. *Actinodaphne percoriacea* S. Julia, **sp. nov.**

(Latin, *per*=very; *coriaceous*=leathery; referring to the very thick leaves)

Actinodaphne borneensis foliis magnis revocans, foliis glabris (vs. infra sparse pubescentibus), basi rotundata ad truncata (vs. acuta), venis lateralibus densis (vs. laxis ad clare dispositis) facile distinguenda. **Typus:** *Clemens 31493*, Borneo, Sabah, Kota Kinabalu District, Gunung Kinabalu, Penibukan (*holo* BO).

Small tree or treelet to 6 m tall. **Bark** pale brown, smooth; inner bark yellowish. **Sapwood** yellowish. **Twigs** drying greyish brown, densely hairy when young, sparsely hairy when older, smooth. **Terminal buds:** scales ovate, 3–9 x 3–5 mm, densely hairy. **Leaves** in whorls of 3–5, coriaceous to thickly coriaceous, shiny above, glabrous on both surfaces or sparsely hairy below, drying red-brown on both surfaces, darker above, sometimes

glaucous below; blade usually elliptic or ovate, rarely obovate, 5.5–16 x 2.5–8.5 cm, base acute to broadly acute, margin revolute, apex acuminate, acumen 0.5–1.5 cm long; midrib raised on both surfaces, stronger below, glabrous or sparsely hairy below; lateral veins 4–7(–10) pairs, dense, at an angle of 45°–50° from the midrib, flat above, slightly raised below, disappearing towards the margin, sometimes joining near the margin on the upper half of leaf; tertiary venation slightly or distinctly prominent above, slightly prominent below, reticulate or pitted; petiole (0.7–)1–2.5 cm long, drying dark brown. **Inflorescences** umbellate, axillary or borne along twigs between the whorls of leaves, sessile; vegetative terminal bud absent; bracts rounded, ovate or elliptic, 3–4 x 3 mm, densely hairy outside, glabrous inside. **Male flowers:** pedicels 2–4 mm long; perianth lobes ovate or elliptic, 2–3 x 2–2.5 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; stamens sparsely hairy at base, anthers 1–1.2 mm long, filaments 0.8–1 mm long; pistillode c. 1.5 mm long. **Female flowers** pedicels c. 2.5 mm long, perianth lobes obovate or rounded, 2–3 mm across, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, c. 0.5 x 0.2 mm, style thick, stigma 0.5–1 mm across, densely hairy; staminodes spatulate, 1.5–2 mm long. **Infructescences** each bearing 3–5 fruits; vegetative terminal buds absent. **Fruits** globose, 0.5–0.8 cm diam., fleshy, drying black; cupule saucer-shaped, 0.3–0.5 cm across, remnant of perianth lobes absent; pedicels to 5 mm long. **Seeds** globose, 0.3–0.4 cm diam., drying black.

Distribution: Endemic in Borneo (Sabah and Sarawak).

Ecology: In montane and limestone forests and also forest on ultrabasic soil at altitudes to 2300 m.

Notes: The species resembles the large-leaved *Actinodaphne borneensis* but can be differentiated by its glabrous (vs. sparsely hairy below) leaves with a broadly acute or truncate (vs. acute) base, dense (vs. lax or well-spaced) lateral veins and reticulate (vs. scalariform) tertiary veins. The leaves of this species are highly variable in size and shape: the larger leaves usually ovate, the medium-sized ones either broadly elliptic or almost rounded and the small-sized leaves elliptic, ovate or slightly obovate. In 1968, Kostermans annotated four specimens (*Clemens* 20620, *Clemens* 31388, *Clemens* 40072, *Clemens* s.n.) as a new species, *A. percoriacea*, but he never validated the name of the new taxon.

Other specimens examined: **BORNEO - SABAH**, Labuk Sugut District, Gunung Tawai, *Sugau* SAN 138834 (SAN), Ranau District, Colombon

Basin, *Clemens* 40072 (BO), *Clemens* 28933 (BO), *Clemens* 30226 (BO), Kamborongo, *Henry SAN* 38309 (SAN), Kinabalu National Park, *Carr SFN* 27725 (SING), Panar Laban, *Sato* 1099 (SAN), *Kostermans SAN* 38469 (SAN), *Meijer SAN* 46520 (KEP, SAN, SAR), *Sinclair & Kadim* 9045 (BO), Penibukan, *Clemens* 31388 (BO), *Clemens s.n.* (BO), *Rao* 134 (SING), *Wood & Wyatt-Smith SAN A* 4491 (KEP, SING), Pig Hill, *Barkman* 107 (KNP), Tenom District, Mount Tomanis, *Dolois et al. SP* 15067 (KNP); **SARAWAK**, Bau District, Bidi Cave, *Clemens* 20620 (SAR), *Ridley s.n.* (SING), Lawas District, Gunung Murud, *Julaihi et al. S* 80034 (KEP, SAR), *S* 80093 (KEP, SAR).

13. *Actinodaphne pruinosa* Nees

Actinodaphne pruinosa Nees in Wall. Pl. As. Rar. 2 (1831) 68; Gamble, J. As. Soc. Beng. 75, 1 (1912) 119; Ridley, Fl. Malay Penins. 3 (1924) 110; Anderson, Checkl. Trees Sarawak (1980) 220; Kochummen, Tree Fl. Malaya 4 (1989) 106; Turner, Gard. Bull. Sing. 47 (1995) 274; Coode *et al.* (eds.), Checkl. Flow. Pl. Gymno. Brunei (1996) 149; Beaman *et al.*, Pl. Mt. Kinabalu (2001) 394 (*p.p.*, *excl. syn. Actinodaphne foxworthyana* Gibbs). **Type:** *Wallich Cat.* 2584b, Peninsular Malaysia, Penang (*holo* K; *iso* BO, L).

Actinodaphne pruinosa var. *kunstleri* Gamble, J. As. Soc. Beng. 75, 1 (1912) 120; Ridley, Fl. Malay Penins. 3 (1924) 110; Burgess, Sabah For. Record 6 (1966) 330; Turner, Gard. Bull. Sing. 47 (1995) 274. **Type:** *King's collector* 6063, Peninsular Malaysia, Perak, Larut (*holo* K).

Syn. nov.: *Actinodaphne concinna* Ridl., J. Fed. Mal. States Mus. 5 (1914) 44, Fl. Mal. Pen. 3 (1924) 110; Kochummen, Tree Fl. Malaya 4 (1989) 104; Turner, Gard. Bull. Sing. 47 (1995) 273. **Type:** *Robinson s.n.*, Peninsular Malaysia, Selangor, Gunung Mengkuang Lebah (*holo* K; *iso* SING)

Distribution: Peninsular Malaysia, Singapore and Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In peat swamp, *kerangas*, mixed dipterocarp, submontane to upper montane forests at altitudes to 4000 m.

Notes: The species closely resembles *Actinodaphne oleifolia* and *A. borneensis* but differs from both in having characters discussed under the notes for *A. oleifolia* and *A. borneensis*.

14. *Actinodaphne robusta* S.Julia, sp. nov.(Latin, *robustus*=robust; referring to the leaves)

Actinodaphne macrophyllae in habitu similis, foliis obovatis ad late ellipticis (vs oblanceolatis ad elliptice oblongis), venis lateralibus valde ascendentibus sed paucioribus differt. **Typus:** *Ilias* S 41159, Borneo, Sarawak, Kapit District, Ulu Sampurau, Bukit Sampandai (holo SAR; iso KEP, SAN).

Tree 12–33 m tall, 30–35 cm diam.; bole straight, c. 7.5 m tall. **Bark** brown, scaly; inner bark red-brown, granular. **Sapwood** whitish. **Twigs** drying dark brown or greyish, sparsely or densely hairy, smooth. **Terminal buds:** scales elliptic or ovate, 15–20 x 10–15 mm, densely hairy. **Leaves** in whorls of 5–7, coriaceous to thickly coriaceous, glabrous above, densely hairy below, drying dark brown on both surfaces or greenish brown below; blade usually broadly obovate or rarely elliptic, (16.5–)22–40(–49) x 7.5–14(–18) cm, base acute to attenuate, margin strongly to slightly revolute, apex acuminate, acumen 0.5–1 cm long; midrib raised on both surfaces, stronger below, glabrous or sparsely hairy above, densely hairy below; lateral veins 7–15 pairs, lax, at an angle of 45°–50° from the midrib, flat or sunken above, strongly raised below, joining near the margin on the upper half of leaf; tertiary venation obscure or slightly distinct and impressed above, distinct below, distantly scalariform; petiole 2.5–6 cm long, drying brownish or dark brown, densely hairy. **Inflorescences** glomerulate, borne along twigs between whorls of leaves; peduncle c. 3 mm long; vegetative terminal bud absent; bracts ovate or elliptic, c. 4 x 3 mm, densely hairy outside, glabrous inside. **Male flowers** unknown. **Female flowers:** pedicels 2–3 mm long; perianth lobes ovate-rounded, 2–2.5 mm across, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, 2–3 mm, style thick, stigma 1–2 mm across, densely hairy; staminodes spatulate, 1.5–2.5 mm long. **Infructescences** each bearing 2–8 fruits; vegetative terminal bud present. **Fruits** globose, 1–1.8 cm diam., fleshy, yellowish when mature, drying black or dark brown; cupule saucer-shaped, 0.7–1.5 cm across, remnant of perianth lobes absent or sometimes present; pedicels 4–5 mm long. **Seeds** globose, 1.2–1.5 cm diam., drying black.

Distribution: Peninsular Malaysia, Borneo (Kalimantan and Sarawak) and the Philippines.

Ecology: In mixed dipterocarp forest, at altitudes to 1100 m.

Notes: The new species resembles *Actinodaphne macrophylla* but differs in having obovate or broadly elliptic leaves (vs. oblanceolate or elliptic-oblong)

and markedly ascending but fewer lateral veins.

Other specimens examined: **PENINSULAR MALAYSIA** – Johore, Labis Forest Reserve, *Saw FRI 36355* (KEP), Mersing, *Teo & Din KL 4940* (KEP), Pahang, Jerantut, Taman Negara, Lata Berkoh, *Ang FRI 23426* (KEP); **BORNEO** – **SARAWAK**, Miri District, Bakong, Ulu Mamut, *Ilias S 24362* (KEP, SAN, SING); **EAST KALIMANTAN**, Gunung Ilas Bungaan, *Kostermans 13741* (BO).

15. *Actinodaphne semengohensis* S. Julia, sp. nov.
(of Semengoh Forest Reserve, Sarawak)

Actinodaphne pruinosa similis, foliis oblanceolatis ad anguste ellipticis (vs. ellipticis ad obovatis) in verticillis non strictis (vs. 3–6 in verticillis strictis) dispositis, inflorescentiis masculis umbellatis ad glomerulatis (vs. racemosis) facile distinguenda. **Typus:** *Anderson & Asah S 12724*, Borneo, Sarawak, Kuching District, Semengoh Forest Reserve (holo SAR; iso BO, SAN, SING).

Figure 1

Tree 15–24 m tall, 18–50 cm diam.; bole straight, c. 20 m tall; buttresses absent. **Bark** brown, smooth; inner bark ochre or brownish, fibrous. **Sapwood** yellowish or whitish. **Twigs** drying greyish brown or black, sparsely hairy, smooth. **Terminal buds:** scales ovate, 3–4 x 2–3 mm, densely hairy. **Leaves** not strictly in whorls, coriaceous, glabrous above, glabrous or sparsely hairy below, drying dark brown above, glaucous below; blade oblanceolate or narrowly elliptic, (5–)7.5–9.5(–12) x (1.8–)2–2.5(–3) cm, base sharply acute, margin flat, apex acute or acuminate, acumen 0.5–1.5 cm long; midrib raised on both surfaces, stronger below, glabrous above, sparsely hairy below; lateral veins 4–6 pairs, lax, at an angle of 30°–40° from the midrib, slightly raised on both surfaces, inconspicuously joining towards the margin; tertiary venation obscure on both surfaces; petiole 1–2 cm long, drying dark brown. **Male inflorescences** racemose, axillary or borne along twigs between the whorls of leaves; peduncle 3–5 mm long; vegetative terminal bud absent; bracts ovate-rounded, 3–4.5 x 2–2.5 mm, densely hairy outside, glabrous inside. **Male flowers:** pedicels 1–1.5 mm long; perianth lobes elliptic or ovate-rounded, 1.5–2 x 1–1.8 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; stamens sparsely hairy at base, anthers 1–1.5 mm long, filaments c. 0.5 mm long; pistillode absent. **Female inflorescences, flowers and fruits** unknown.

Distribution: Endemic in Borneo (Sarawak and Sabah).

Ecology: In primary mixed dipterocarp and submontane forests at altitudes to 1500 m.

Notes. The species resembles *Actinodaphne pruinosa* but can be distinguished by its oblanceolate or narrowly elliptic (vs. elliptic or obovate) leaves arranged in pseudo-whorls (vs. in whorls) and racemose (vs. umbellate or glomerulate) male inflorescences. (Although the original description of *A. pruinosa* described the inflorescence as racemose, at least in the male inflorescence, racemose inflorescences have not been observed in Bornean specimens, which are consistently umbellate). It is also reminiscent of *A. oleifolia* but differs by its pseudo-whorled (vs. whorled) leaves with obscure (vs. distinctly pitted or reticulate) tertiary veins and racemose (vs. umbellate) male inflorescences.

Other specimens examined: **BORNEO – SABAH**, Keningau District, Trus Madi, *Meijer SAN 122587* (SAN), Ranau District, Kinabalu National Park, *Chow & Madani SAN 74527* (SING), *Meijer SAN 57510* (SAN); **SARAWAK**, Kuching District, Semengoh Forest Reserve, *Bojeng S 14620* (BO, SAN, SAR, SING), *Rosli S 16425* (BO, SAN, SAR, SING), *Rosli S 16453* (BO, SAN, SAR, SING), *Othman Ismawi S 57220* (SAN, SAR).

16. *Actinodaphne soepadmoi* S.Julia, sp. nov.

(Engkik Soepadmo, 1993–present, Coordinator/Chief Editor of the Tree Flora of Sabah and Sarawak Project)

Actinodaphne glabram approximata, foliis late obovatis (vs. ellipticis vel elliptice oblongis vel oblanceolatis) indice longitudinis/latitudinis 2:1 (vs. 3–4:1) facile distinguenda. **Typus:** *Julia & Sirukit S 91375*, Borneo, Sarawak, Kuching District, Semengoh Forest Reserve (holo SAR; iso KEP).

Figure 1

Tree 20–30 m tall, 15–40 cm diam.; bole straight, c. 15 m tall; buttresses 0.5–0.6 m tall, c. 6 cm wide, not spreading. **Bark** blackish or reddish brown, smooth or with sparse rings; inner bark brownish, granular. **Sapwood** yellowish. **Twigs** drying blackish, sparsely hairy, sparsely lenticellate. **Terminal buds:** scales lanceolate, 10–15 x 4–6 mm, densely hairy. **Leaves** in whorls of 5–6, thickly coriaceous, shiny above, glabrous on both surfaces or sparsely hairy below, drying brown on both surfaces or greenish brown above, glaucous below; blade plane, obovate, 14.5–20.5 x 4.5–9 cm, base acute, margin strongly revolute, apex rounded or bluntly acute; midrib

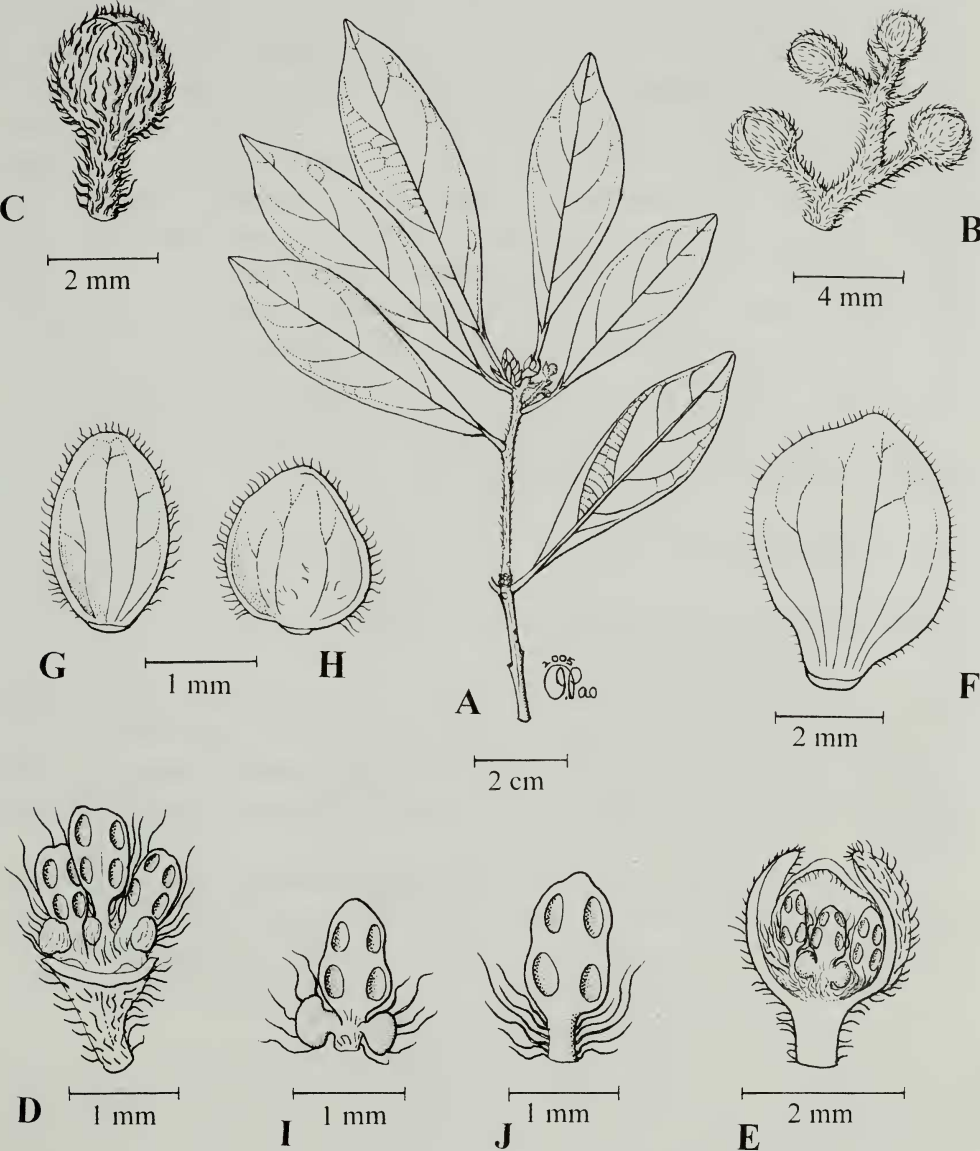


Figure 1. *Actinodaphne semengohensis*. A, leafy twig; B, male inflorescence; C, male flower; D, male flower showing stamens; E, longitudinal section of male flower; F, bract; G & H, perianth lobes; I, stamen with glands; J, stamen without gland (all from *S* 12724)

sunken above, strongly raised below; lateral veins 6–8 pairs, lax, at an angle of 40°–45° from the midrib, slightly sunken above, strongly raised below, disappearing towards the margin, sparsely hairy on both surfaces; tertiary venation distinct on both surfaces, closely scalariform; petiole 2–6 mm long, drying dark brown, sparsely hairy. **Male inflorescences** and **flowers** unknown. **Female inflorescences** glomerulate, borne along twigs between the whorls of leaves; peduncle 5–14 mm long; vegetative terminal bud present; bracts ovate or rounded, 3.5–5 x 5–6 mm, sparsely hairy outside, glabrous inside. **Female flowers:** pedicels 2–3 mm long; perianth lobes ovate, 2–4 x 1.5–4 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, c. 1.5 x 0.5 mm, style thick, stigma 0.8–1.5 mm across, densely hairy; staminodes spatulate, 1–1.5 mm long. **Infructescences** each bearing 1–4 fruits; vegetative terminal bud present. **Fruits** globose, 0.7–1.5 cm diam., fleshy, yellow turning to red when mature, drying black; cupule sometimes swollen, saucer-shaped, 0.6–1.3 cm across, remnant of perianth lobes absent; pedicel 5–12 mm long. **Seeds** globose, 0.8–1 cm diam., drying dark brown.

Distribution: Peninsular Malaysia and Borneo (Sarawak).

Ecology: In mixed dipterocarp forest at altitudes to 300 m.

Notes: Even though the male inflorescence and flower are not available, this species is placed in *Actinodaphne* based on the combination of its vegetative characters (perulate buds, bud scales leaving scars above the whorled leaves) and the characters of its female inflorescence and trimerous flower.

Actinodaphne soepadmoi resembles *A. glabra* but differs in having obovate (vs. oblanceolate or narrowly elliptic) leaves. The new species is also reminiscent of *Actinodaphne myriantha* but can be distinguished by its obovate (vs. obovate-elliptic or narrowly elliptic) leaves having an obtuse or almost rounded (vs. acute or acuminate) apex.

Kochummen (1989) identified and described a single collection (Ridley 16125) from Gunung Tahan, Peninsular Malaysia as *A. obovata*. In comparing the specimen with the type image and description of *A. obovata* (Wall. ex Nees) Blume, it is concluded that the specimen does not belong to *A. obovata* but to *A. soepadmoi*.

This new species is named in honour of Dr. E. Soepadmo for his dedication and contribution to the knowledge of the Tree Flora of Sabah and Sarawak.

Other specimens examined: **PENINSULAR MALAYSIA** – Pahang,

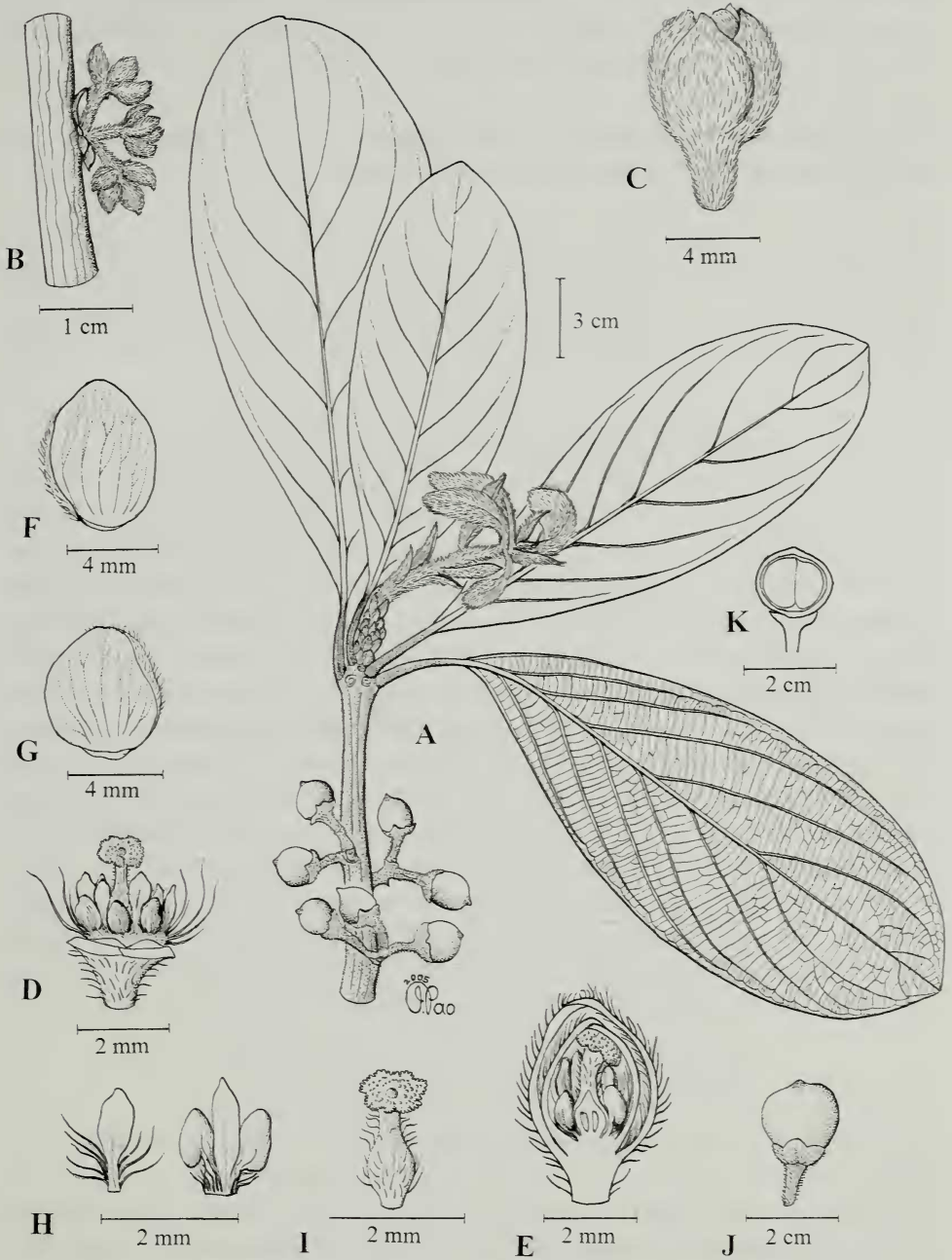


Figure 2. *Actinodaphne soepadmoi*. A. fruiting leafy twig; B. female inflorescence; C. female flower; D. longitudinal section of female flower showing pistil and staminodes; E. longitudinal section of female flower; F-G. perianth lobes; H. staminodes; I. pistil; J. fruit; K. longitudinal section of fruit (A from *S* 37704, B-I from *S* 91375, J & K from *S* 45548)

Gunung Tahan, *Ridley 16125* (SING). **BORNEO – SARAWAK**, Kuching District, Semengoh Forest Reserve, *Ilias S 37704* (KEP, SAN, SAR), Belaga District, Sungai Iban, *Bernard S 45548* (KEP, SAN, SAR).

17. *Actinodaphne spathulifolia* S.Julia, sp. nov.

(Latin, *spathulatus*=spathula-shaped, *folium*=leaf)

Actinodaphne fuliginosam revocans, foliis oblanceolatis (vs. obovatis) maioribus (5–7.5 cm longis, 2.5–4 cm latis, vs. 2.5–4.5 cm longis, 1.5–2.5 cm latis), costa venis lateralibus tertiariisque conspicuis (vs. obscuris) differt. **Typus:** *Latiff et al. ALM 4178*, Borneo, Sarawak, Marudi District, Kelabit Highlands, Bario (holo SAR).

Tree or treelet 4–33 m tall. **Twigs** drying black, densely hairy when young, sparsely hairy when older, smooth. **Leaves** in whorls of 4–5, thickly coriaceous, glabrous on both surfaces, drying shining and greenish brown above, greyish brown below; blade oblanceolate, 5–7.5 x 2.5–4 cm, base cuneate or sharply acute, margin strongly revolute, apex rounded; midrib sunken above, raised below, sparsely hairy below; lateral veins 5–6 pairs, lax, at an angle of c. 40° from the midrib, sunken above, raised below, disappearing towards the margin; tertiary venation obscure on both surfaces; petiole 1.2–1.5 cm long, drying black. **Male inflorescences** and **flowers** unknown. **Female inflorescences** glomerulate, axillary or borne along twigs between the whorls of leaves; vegetative terminal bud absent; bracts elliptic, 2.5–3 x 2–2.2 mm, sparsely hairy outside, glabrous inside. **Female flowers** (young): pedicels 1.8–2 mm long; perianth lobes ovate-rounded, 1–1.5 x 1–1.2 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, c. 0.8 x 0.4 mm, style c. 0.4 mm long, stigma c. 0.3 mm across, densely hairy; staminodes spathulate, 0.8–1 mm long. **Infructescences** and **fruits** unknown.

Distribution: Endemic in Borneo (Sabah and Sarawak).

Ecology: In *kerangas* and submontane forests at altitudes to 1800 m.

Notes: Even though the male inflorescence and flower are not available, this species is placed in *Actinodaphne* based on the combination of its vegetative characters (perulate buds, bud scales leaving scars above the whorled leaves) and the characters of its female inflorescence and trimerous flowers.

The species resembles *A. fuliginosa* but differs by its oblanceolate (vs. obovate) and broader, 2.5–4 cm wide (vs. 1.5–2.5 cm) leaves with prominent (vs. obscure) midrib, lateral veins and tertiary veins.

Other specimens examined: **BORNEO - SABAH**, Ranau District, Kinabalu National Park, *Kitayama 4480* (KNP); **SARAWAK**, Marudi District, Kelabit Highlands, Bario, *Nooteboom & Chai 2150* (KEP, SAR).

18. *Actinodaphne sulcata* S. Julia, sp. nov.

(Latin, *sulcatus*=grooved; referring to the midrib and lateral veins on upper leaf surface)

Actinodaphne kinabaluensi foliis bullatis similis, foliis obovatis (vs. ellipticis), fructibus globosis (vs. ellipsoideis) differt. **Typus:** *Nooteboom & Chai 2245*, Borneo, Sarawak, Marudi District, Kelabit Highlands (holo SAR; iso KEP).

Tree or treelet 3–10 m tall, 1.5–17 cm diam.; bole straight, c. 4 m tall. **Bark** creamy or brownish, smooth; inner bark greenish, granular. **Sapwood** yellowish or whitish. **Twigs** drying greyish or dark brown, sparsely or densely hairy when young, sparsely hairy when older, smooth or sparsely large-lenticellate. **Terminal buds:** scales ovate, 5–10 x 3–5 mm, densely hairy. **Leaves** in whorls of 3–5, thickly coriaceous, glossy and glabrous above, sparsely hairy below, drying red-brown or greenish brown above, brown below; blade bullate, obovate, 10–15(–19) x 4–7(–8.5) cm, base sharply acute, margin revolute, apex acuminate, acumen 0.5–1.5 cm long; midrib sunken or flat above, strongly raised below, glabrous or sparsely hairy below; lateral veins 7–10 pairs, lax, at an angle of 40°–45° from the midrib, strongly sunken above, strongly raised below, disappearing towards the margin or joining near the margin in the upper half of leaf; tertiary venation distinct on both surfaces or sunken above, distantly scalariform; petiole 0.6–1(–5) cm long, sparsely or densely hairy, drying dark brown or black. **Inflorescences** umbellate (female) or racemose (male), axillary or borne along twigs between the whorls of leaves, subsessile; vegetative terminal bud absent; bracts ovate-rounded, 3–4 x 3.5–4 mm, sparsely hairy outside, glabrous inside. **Male flowers:** pedicels c. 5 mm long; perianth lobes elliptic or elliptic-oblong, 3–3.5 x 1.2–2.2 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; stamens sparsely hairy at base, anthers 0.8–1.2 mm long, filaments 0.8–1.2 mm long; pistillode 0.6–0.8 mm long. **Female flowers:** pedicels c. 5 mm long, perianth lobes elliptic or oblong, 3–3.5 x 1.5–2.2 mm, outer lobes slightly larger than the inner ones, densely hairy outside, glabrous inside; ovary ovoid, c. 2 x 1.5 mm, style thick, stigma 0.8–1 x 0.8 mm, densely hairy; staminodes spatulate, 1.5–2.5 mm long. **Infructescences** each bearing 1–5 fruits; vegetative terminal bud absent. **Fruits** globose, 0.6–0.8 cm diam., drying black; cupule swollen, saucer-shaped, 0.5–0.8 cm across, remnant of perianth lobes absent; pedicel 5–8 mm long. **Seeds** globose, 0.3–0.5 cm diam., drying dark brown.

Distribution: Endemic in Borneo (Sabah and Sarawak).

Ecology: In mixed dipterocarp and submontane forests at altitudes to 1400 m.

Notes: The species resembles *Actinodaphne kinabaluensis* in its bullate leaves but differs in having globose fruits (vs. ellipsoid) and obovate leaves (vs. elliptic leaves).

In Sabah and Sarawak two varieties, var. *sulcata* and var. *longipetiolata*, are known.

var. *sulcata*

Distribution: Endemic in Borneo (Sabah and Sarawak). In mixed dipterocarp and submontane forests, at altitudes 1200–1400 m.

Other specimens examined: **BORNEO** — **SABAH**, Sipitang District, Bukit Rimau, Pius & Ubaldos SAN 143457 (KEP, SAN, SAR, SING), Long Miau, Meligan, Dewol & Kambira SAN 141813 (SING); **SARAWAK**, Lawas District, Ulu Sungai Belaban, Gunung Murut, Ilias S 26424 (SAR).

var. *longipetiolata* S.Julia, var. nov.

(Latin, *longi*=long, *petiolatus*=petiole)

A var. *typica* foliis petiolisque longioribus, 3–5 cm longis (vs. 0.6–1 cm longis) differt. **Typus:** *Julius et al.* SAN 132805, Borneo, Sabah, Sipitang District, Maligan Forest Reserve (holo SAN; iso KEP, SAR).

Distribution: Endemic in Borneo (Sabah) and known only by the type specimen. Found in mixed dipterocarp forest, at c. 1400 m altitude.

Notes: This variety can be distinguished from var. *sulcata* by its longer (3–5 cm vs. 0.6–1 cm), sparsely hairy (vs. densely hairy) petiole.

19. *Actinodaphne venosa* S.Julia, sp. nov.

(Latin, *venosus*=conspicuously veined; the leaves)

Actinodaphne malaccensi e Malaysia peninsulari similis, ramulis glabris (vs. dense ferrugineo-tomentosis), foliis ellipticis ad oblanceolatis (vs. elliptice oblongis ad lanceolatis) venis tertiariis conspicuis (vs. obscuris ad inconspicuis) facile distinguenda. **Typus:** *Ampuria* SAN 32859, Borneo, Sabah, Beluran District, near Tidog Camp (holo SAN; iso BO, KEP, SING).

Tree or treelet, (2–)4–35 m tall, (5–)15–45 cm diam.; bole straight, 2–9 m tall; buttresses absent. **Bark** brownish, greenish or greyish, smooth; inner bark yellowish, fibrous. **Sapwood** yellowish. **Twigs** drying dark brown or greyish brown, densely hairy when young, sparsely hairy when older, smooth or sometimes fissured or sparsely large-lenticellate. **Terminal buds:** scales ovate, lanceolate or linear, 3–5 x 1–2 mm, densely or sparsely hairy. **Leaves** in whorls of 3–5, thinly coriaceous, sometimes shiny above, glabrous on both surfaces or sparsely hairy below, drying brownish, greenish brown or reddish brown on both surfaces or glaucous below; blade obovate or elliptic, 9.5–16.5(–18) x 3–6(–9) cm, base acute, margin flat or slightly revolute, apex acuminate or shortly cuspidate, acumen *c.* 1 cm long; midrib sunken or flat above, strongly raised and sparsely hairy below; lateral veins 4–7(–9) pairs, dense, at an angle of 30°–40° from the midrib, slightly or strongly sunken above, strongly raised below, joining towards the margin; tertiary venation distinct on both surfaces, sunken above, closely scalariform; petiole 1.2–2(–2.5) cm long, drying brown or black, sparsely hairy. **Inflorescences** umbellate, borne along twigs between the whorls of leaves, sessile; vegetative terminal bud absent; bracts rounded or ovate, 1.5–3 x 1–2 mm, sparsely to densely hairy outside, glabrous inside. **Male flowers:** pedicels 2–4 mm long; perianth lobes ovate or elliptic, 1–2 x 0.8–1 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; stamens sparsely hairy at base, anthers *c.* 1.5 mm long, filaments *c.* 1.5 mm long; pistillode *c.* 1.5 mm long. **Female flowers:** pedicels 1–2 mm long, perianth lobes ovate or elliptic, 1–2 x 0.5–1 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, *c.* 1 x 0.5 mm, style thick, stigma *c.* 0.5 mm across, densely hairy; staminodes spatulate, *c.* 1 mm long. **Infructescences** each bearing 1–4 fruits; vegetative terminal bud absent. **Fruits** globose, 0.6–1.5 cm diam., fleshy, drying black; cupule saucer-shaped, 0.5–0.8 cm across, remnant of perianth lobes present or absent; pedicel 3–7 mm long. **Seeds** globose, 0.5–1 cm diam., drying black.

Distribution: Endemic in Borneo (Brunei, Kalimantan, Sabah and Sarawak).

Ecology: In mixed dipterocarp, submontane, riparian forests and forest on ultrabasic soil at altitudes to 1300 m.

Notes: The new species resembles *Actinodaphne malaccensis* Hook.f. from Peninsular Malaysia but can readily be distinguished by its glabrous (vs. densely rusty-tomentose) twig, elliptic or oblanceolate (vs. elliptic-oblong or lanceolate) leaves with distinctly prominent (vs. obscure or very faintly visible) tertiary veins. The species also resembles *A. borneensis* and *A.*

pruinosa but differs from the former by its thinly coriaceous (vs. coriaceous or thickly coriaceous) leaves, dense (vs. lax or well-spaced) lateral veins and distinct (vs. obscure) tertiary veins, and from the latter in having leaves with a length:width ratio of 2:1 (vs. length: width ratio of 3:1) and sunken lateral veins (vs. flat) above. In vegetative characters the species is also close to *A. montana* Gamble from Peninsular Malaysia but differs by its strongly impressed (vs. raised) lateral veins on upper surface of leaves and umbellate (vs. paniculate or racemose) inflorescence.

Other specimens examined: **BORNEO - SABAH**, Beaufort District, Klias, *Meijer SAN 31411* (SAN), Lumat, *Daud & Karim SAN 77929* (SAN), Kinabatangan District, Maliau Basin, *Ming & Sidkan, MB 814* (SAN), Ulu Sungai Pingas-pingas, *Sumbing SAN 110950* (SAN), Kuala Penyu District, Klias, *Meijer SAN 31411* (SAN), Labuk Sugut District, Beluran, *Ampuria SAN 32859* (BO, KEP, SAN, SING), Lungmanis, *Wood A 3994* (KEP, SING), Lahad Datu District, Binuang, *Nordin SAN 54576* (SAN), Danum Valley, *Dewol SAN 129455* (SAN), *Dewol SAN 134978* (SAN), *Campbell 214* (SAN), Gunung Silam, *Agam, SAN 37165* (SING), Kalumpang Forest Reserve, *George et al. SAN 123904* (SAN), *Agam SAN 40863* (BO, SAN), *SAN 37165* (SAN, SING), Madai Forest Reserve, *Nordin SAN 47763* (SAN), Segama, Bukit Belachan, *Chai SAN 31722* (KEP, SAN, SAR, SING), Ulu Sungai Tabin, *Dewol SAN 129528* (SAN), *James SAN 35358* (SAN), Ranau District, Gunung Kinabalu, *Clemens 31728* (BO), *Clemens 32292* (BO), Semporna District, Mount Pock Forest Reserve, *Nordin SAN 54463* (SAN), Tambunan District, Trus Madi, *Kamaruddin & Latiff KMS 1782* (SAN), Tawau District, *Elmer 20947* (BO, PNH, SING), Betoton, *Orolfo BNB 3221* (PNH); **SARAWAK**, Bau District, *Mamit S 29592* (BO, SAR), Kapit District, Bukit Kumbong, *Runi et al. S 60068* (SAN, SAR), Belaga District, Upper Rejang, *Clemens 21861* (BO, SAR), Kapit District, Ulu Sungai Melatai, *Yii S 48364* (SAR), Kuching District, Padawan, Gunung Siruruh, *Yii S 55270* (SAN, SAR), Bako National Park, Telok Asam, *Purseglove P 4973* (SAR), Limbang District, Sungai Ensungei, *Rena et al. S 42875* (KEP, SAN, SAR), *Rena et al. S 42934* (KEP, SAN, SAR), Lubok Antu District, Nanga Sumpa, *Christensen 1493* (SAR), Marudi District, Gunung Mulu National Park, *Chai S 39750* (KEP, SAN, SAR), *Chai S 39667* (KEP, SAN, SAR), *Yii & Talib S 58659* (KEP, SAR), Sri Aman District, Lingga, G. Lesung, *Hansen 1019* (KEP, SAN, SAR); **BRUNEI**, Belait District, Melilas, *Atkins et al. SA 539* (KEP, SAN, SING); **KALIMANTAN**, Without locality, *Kostermans 8977* (BO) and *Kostermans s.n.* (BO), Kutai, Belajan River, *Endert 1927* (BO) and Sungai Wain, *Kostermans 4328* (BO).

Incompletely Known Species

20. *Actinodaphne* sp. 1

Twigs drying black, densely hairy when young, sparsely hairy when older, smooth. **Terminal buds:** scales ovate, *c.* 3 x 2 mm, sparsely hairy. **Leaves** in whorls of 3–5, thickly coriaceous, shiny and glabrous above except on the midrib and lateral veins, sparsely hairy below, drying greyish brown above, brown below; blade elliptic, 7.5–10 x 3–4 cm, base acute, margin strongly revolute, apex acute; midrib raised on both surfaces, stronger below; lateral veins 4–5 pairs, lax, at an angle of *c.* 45° from the midrib, flat or sunken above, raised below, disappearing towards the margin; tertiary venation distinct on both surfaces, sunken above, distantly scalariform; petiole 0.8–1 cm long, drying black, densely hairy, glabrescent. **Male inflorescences and flowers** unknown. **Female inflorescences** racemose, borne along twigs between the whorls of leaves; peduncle 3–5 mm long, densely hairy; vegetative terminal bud present; bracts ovate, *c.* 0.3 x 0.2 mm, densely hairy outside, glabrous inside. **Female flowers:** pedicels 2–3 mm long; perianth lobes elliptic, *c.* 1.5 x 1 mm, outer lobes slightly larger than the inner ones, thin, densely hairy outside, glabrous inside; ovary ovoid, *c.* 0.5 x 0.3 mm, style thick, *c.* 1 mm long, stigma *c.* 0.4 mm across, densely hairy; staminodes spatulate, *c.* 1 mm long. **Infructescences and fruits** unknown.

Distribution: Known only from a single collection (*Chew et al. RSNB 1840*) from Gunung Kinabalu, Sabah.

Notes: This taxon resembles *Actinodaphne kinabaluensis* but differs in having plane (vs. bullate) leaves, shorter petiole and yellowish (vs. brownish) hairs on the leaf undersurface. The species is placed in *Actinodaphne* based on the combinations of its vegetative (perulate buds, bud scales leaving scars above the whorled leaves) and reproductive characters (trimerous flowers). However, to formally describe the specimen as a new species more specimens are needed to elucidate its taxonomic status, as there is a possibility that this incompletely known species may represent a variety of the already known species.

Acknowledgements

This synopsis represents a precursory paper of the revision of *Actinodaphne* for the Tree Flora of Sabah and Sarawak Project funded by the Malaysian Ministry of Science, Technology and Innovation (MOSTI) under the IRPA

Research Grant No. 08-04-01-0165. I wish to extend my gratitude for the support and encouragement given by the Director-General of the Forest Research Institute Malaysia and the Directors of the Forestry Departments of Sabah and Sarawak; to the Curators of the herbaria BO, K, KEP, L, PNH, SAR, SAN, SING and the Kinabalu National Park, Sabah, for the loan of specimens and images of type specimens and also for their cooperation and hospitality during my visits to their institutions. I am grateful to Dr. E. Soepadmo (KEP) and Dr. Ruth Kiew (SING) for their constant guidance, critical comments and valuable advice during the preparation of this paper. Dr. J.F. Velkamp (L) is thanked for preparing the Latin diagnoses of the new taxa and Joseph Pao (SAR) for preparing the botanical illustrations.

References

- Anderson, J. A. R. 1980. Lauraceae. *A Checklist of the Trees of Sarawak*. pp. 220–230.
- Argent, G., A. Saridan, E.J.F. Campbell, P. Wilkie, G. Fairweather, J.T. Hadiyah, D.J. Middleton, C. Pendry, M. Pinard, M. Warwick & K.S. Yulita (eds.). 1997. Lauraceae. In: *Manual of the Larger and More Important Non-dipterocarp Trees of Central Kalimantan, Indonesia*. **1**: 300–331.
- Beaman, J.H., C. Anderson & R.S. Beaman. 2001. Lauraceae. In: *The Plants of Mount Kinabalu. Dicotyledon Families: Acanthaceae to Lythraceae*. **4**: 393–419.
- Blume, C.L. 1851. Ordo Laurineae. *Museum botanicum Lugdono-Batavum*, **1**, **22**: 341–347.
- Burgess, P.F. 1966. Lauraceae. Timbers of Sabah. *Sabah Forest Record No.* **6**. pp. 330–336.
- Coode, M.J.E., J. Dransfield, L.L. Forman, D.W. Kirkup and Idris M. Said (eds.). 1996. Lauraceae. In: *A Checklist of the Flowering Plants and Gymnosperms of Brunei Darulssalam*. pp.149–158.
- IPNI (International Plant Names Index). Published on the internet; <http://www.ipni.org> (accessed in March 2005).
- Kochummen. 1989. Lauraceae. *Tree Flora of Malaya*. **4**: 98–178.
- Kostermans, A.J.G.H. 1957. Lauraceae. *Communication Forestry Research*

Institute Bogor. **57**: 1–64.

Masamune, G. 1942. Lauraceae. *Enumeratio Phanerogamarum Borneorum*. pp. 306–317.

Merrill, E. D. 1921. Lauraceae. Enumeration of Bornean Plants. *Journal of the Straits Branch of Royal Asiatic Society*, Special Number. pp 272–280.

Merrill, E.D. 1929. Lauraceae. *Plantae Elmerianae Borneenses*. *University of California Publication in Botany* **15**: 77–91.

Miquel, F.A.W. 1858. Laurineae. *Flora Indiae Batavae* 1, 1: 888–977.

Nees, C.G. 1831. *Actinodaphne*. In: Wallich, *Plantae Asiaticae Rariores*. **2**: 61, 68

Rohwer, J.G. 1993. Lauraceae. In: Kubitzki, K., J.G. Rohwer & V. Bittrich (eds.). *The Families and Genera of Vascular Plants*. **2**: 366–391.

Werff, H. van der. 2001. An annotated key to the genera of Lauraceae in the Flora Malesiana region. *Blumea*. **46**: 125–140.

Identification list of specimens examined

The number after the collector and/or serial number refers to the following *Actinodaphne* taxa.

- | | |
|---|--|
| 1 = <i>A. borneensis</i> Meisn. | 11 = <i>A. oleifolia</i> Gamble |
| 2 = <i>A. diversifolia</i> Merr. | 12 = <i>A. percoriacea</i> S. Julia |
| 3 = <i>A. fuliginosa</i> Airy Shaw | 13 = <i>A. pruinosa</i> Nees |
| 4 = <i>A. glabra</i> Blume | 14 = <i>A. robusta</i> S. Julia |
| 5 = <i>A. glomerata</i> (Blume) Nees | 15 = <i>A. semengohensis</i> S. Julia |
| 6 = <i>A. johorensis</i> Gamble | 16 = <i>A. soepadmoi</i> S. Julia |
| 7 = <i>A. kinabaluensis</i> Kosterm. | 17 = <i>A. spathulifolia</i> S. Julia |
| 8a = <i>A. kostermansii</i> S. Julia var. <i>kostermansii</i> | 18a = <i>A. sulcata</i> S. Julia var. <i>longipetiolata</i> S. Julia |
| 8b = <i>A. kostermansii</i> S. Julia var. <i>glabrescens</i> S. Julia | 18b = <i>A. sulcata</i> S. Julia var. <i>sulcata</i> |
| 9 = <i>A. macrophylla</i> (Blume) Nees | 19 = <i>A. venosa</i> S. Julia |
| 10 = <i>A. myriantha</i> Merr. | 20 = <i>A. sp. 1</i> |

Achmad 1356: 5 — Anderson *s.n.*: 1; Anderson *s.n.*: 4 — Ando *et al.* AKK 30: 9; AKK 42: 9 — Argent & Amiril 9320: 11 — Ariffin ARK 35: 5 — Ariffin & Arbainsyah AA 977: 10 — Atkins *et al.* SA 439: 5; SA 450: 1; SA 539: 19.

Balajadia BNB 3061: 13; 7068: 5 — Barkman 107: 12 — Benedict SP 5939: 13 — BRUN 565: 2; BRUN 1465: 1; BRUN 2412: 5; BRUN 10384: 13; BRUN 15026: 1; BRUN 15055: 5; BRUN 16933: 5; BRUN 16634: 5; BRUN

16209: 1; BRUN 18061: 13; BRUN 18285: 9.

Campbell EG 199: 5; EG 214: 19; 271:12 — Chew CWL 452: 4; CWL 507: 5; CWL 1212: 4 — Christensen 1493: 19 — Christensen & Apu 486: 13; 582: 13 — Church 424: 5; 473: 5 — Church & Mahyar 1879: 10 — Clemens 111: 4; 20042: 13; 20157: 13; 21859: 4; 21860: 4; 21861: 1; 26668: 5; 27707: 11; 28814: 5; 29408: 5; 20620: 12; 28933: 12; 29116: 11; 30008: 13; 30226: 12; 31159: 2; 31278: 1; 31364: 2; 31388: 12; 31493: 12; 31728: 19; 32292: 19; 33629: 11; 33798: 11; 35113: 11; 30467: 13; 32437: 13; 32490: 13; 32613: 13; 34340: 13; 37707: 13; 40072: 12; 50386: 8a; Clemens *s.n.*: 12 — Coode *et al.* MC 7590: 11; MC 7869: 8a — Cousens 69770: 9 — Curtis 1020: 13.

Daim 302: 2; 635: 13; 639: 2; 643: 5; 673: 5; 692: 13; 966: 13 — De Vogel 1702: 5 — Dewanie 51: 2 — Dolois *et al.* SP 15067: 12 — Dransfield JD 7467: 2 — Dransfield *et al.* JD 7096: 5; JD 7171: 13.

Elmer 20947: 19; 21238: 10; 21335: 10; 21802: 10; 21809: 10 — Enchai 10382: 5 — Endert 1927: 19; 2249: 5; 3330: 9; 4733: 5; 5149: 10 — Enggoh 10421: 5. Forman & Blewett LFL 805: 9 — FMS 17513: 13; FMS 20441: 11; FMS 34480: 4; FMS 36677: 5; FMS 37221: 4; FMS 37392: 9; FMS 37393: 13; FMS 41203: 5; FMS 41223: 5; FMS 42900: 5; FMS 48728: 5; FMS 49161: 5 — FRI 2036: 9; FRI 2073: 13; FRI 3237: 11; FRI 6135: 11; FRI 8150: 6; FRI 12721: 11; FRI 13229: 13; FRI 13725: 13; FRI 13889: 13; FRI 16998: 11; FRI 19870: 11; FRI 20395: 13; FRI 20684: 11; FRI 21864: 13; FRI 23426: 14; FRI 36355: 14; FRI 41338: 1; FRI 124124: 9.

Gadon KL 837: 5 — Geh GSY 802: 5 — Geofarry *et al.* SP 17178: 2 — Gibbs 3135: 2 — Gusili SP 9937: 13.

Hallier 1032: 5; 1059: 5; 1713: 13; B 1859: 13 — Hansen 801: 5; 1019: 19 — Haviland 629: 5; Haviland 737: 5; Haviland 1756: 10; Haviland 1944: 13; Haviland 2490: 13; Haviland 3328: 10 — Haviland ... Hose 3647A: 6 — Henry & Sidkan MB 96: 11; MB 116: 11 — Hotta 13948: 5 — Hou 415: 10. Jacobs 5086: 5 — John Sugau SIP-B 69: 4 — Junghuhns *n.*: 5.

Kamaruddin KA 30: 2 — Kamaruddin & Latiff KMS 1782: 19 — Keith 7088: 5 — KEP 10770: 2; KEP 20503: 13; KEP 51761: 13; KEP 55426: 2; KEP 64756: 13; KEP 66577: 11; KEP 78898: 13; KEP 84780: 9; KEP 85040: 13; KEP 85056: 13; KEP 94469: 13; KEP 94823: 13; KEP 99378: 13; KEP 104628: 13 — Kessler PK 917: 10 — King's Collector 6172: 9; 6435: 5; 7349: 11 — Kinsun 469: 4 — Kirkup *et al.* DK 438: 1; DK 749: 1 — Kitayama 4480: 17 — Kokawa & Hotta 5603: 8b — Koorders 2788: 5; 3264: 5; 3619: 5; 3707: 5; 3718: 5; 5146: 5; 10960: 5; 10966B: 5; 13817B: 5; 13924: 5; 14151: 5; 26772: 5; 30515: 5; 137814: 5 — Kostermans 3208: 9; 4328: 19; 4412: 10; 4558: 10; 4696: 2; 4888: 12; 4957: 5; 5146: 5; 5285: 5; 5352: 4; 5479: 5; 5788: 9; 5859: 5; 5986: 9; 6007: 4; 6815: 4; 6954: 2; 7333: 13; 7361: 9; 7544: 13; 7560: 9; 7615: 13; 8116: 1; 8953: 4; 8789: 5; 8977: 19; 8942: 5; 9064: 13; 9069: 13; 9106: 10; 9242: 1; 9929: 5; 10054: 13; 10608: 5; 10676: 1; 12660: 5; 12875: 13; 12901:

11; 13088: 13; 13230: 5; 13479: 5; 13741: 14; 21013: 5; 21402: 5; 21640: 5; 23020: 5; 23932: 5; *s.n.*: 19 — Kuswata 964: 5; 1021: 1.

Latiff *et al.* ALM 4178: 17 — Leighton 13: 10; 133: 13 — Lim *et al.* LSP 1184: 4 - Lobb *s.n.*: 1 — Lomudin 510: 1 — Lorence Lugas 876: 4; 970: 13; 1922: 8b; 2387: 4.

Mahyar *et al.* 1172: 13 — Maingayi 1258: 9; 1275: 9 — McDonald & Ismail 4050: 4 — Ming & Sidkan, MB 814: 19 — Ming & Sidkan MB 814: 19 — Mogeia & de Wilde 3823: 13 — Mohd Nur 11232: 11 — Mohd. Shah 3502: 13 — Mohd Shah & Ahmad Shuker MS 3253: 4 — Mohizah & Yahud ITTO/BC 69: 4 — Murata B-2600: 11.

Native Collector 1690: 13; 2174: 6 — Norazami AZ 17: 2 — Nooteboom & Chai 1895: 4; 2150: 17; 2245: 18b — Orolfo BNB 3221: 19.

Pereira JTP 327: 2; JTP 372: 11 — Phillipps SNP 1926: 13; SNP 3029: 11 — Podzorski SMHI 757: 14 — Poore H 308: 13 — Purseglove P 4973: 1.

Ramlanto & Fanani 678: 5 — Ramos 1159: 1; 1216: 5; 1838: 2 — Rao 134: 12 — Reksodihajo 750: 5 — Reza RA 129: 5 — Ridley 4419: 7; Ridley 6296: 5; Ridley 6741: 5; 11675: 5; 13728: 11; 13783: 5; 16125: 16; Ridley *s.n.*: 12; *s.n.*: 5 — Ridsdale SMHI 21: 4; SMHI 1514: 14 — Rimi & Geofarry SP 8112: 11 — Rimi *et al.* SP 6276: 8b; SP 6284: 11; SP 6311: 11; 7374: 13; SP 9289: 11; TS 6573: 1 — Robinson *s.n.*: 11 — RSNB 13: 2; RSNB 137: 13; RSNB 196: 7; RSNB 1251: 2; RSNB 1840: 20; RSNB 4113: 5; RSNB 4383: 11; RSNB 4567: 5; RSNB 4660: 11; RSNB 4754: 11; RSNB 4832: 11.

S 97: 10; S 448: 10; S 1455: 4; S 1583: 10; S 2179: 1; S 4437: 6; S 4607: 11; S 4778: 5; S 8151: 4; S 8294: 1; S 9160: 13; S 12724: 15; S 13131: 6; S 14620: 15; S 16425: 15; S 16453: 15; S 16988: 13; S 17624: 5; S 18227: 4; S 18727: 1; S 19079: 11; S 19114: 1; S 20874: 10; S 22164: 1; S 22182: 4; S 22783: 1; S 24362: 14; S 25437: 13; S 26424: 18b; S 27391: 10; S 28414: 9; S 28492: 5; S 29592: 19; S 33554: 5; S 33793: 13; S 34520: 5; S 34665: 10; S 34763: 5; S 35668: 1; S 37704: 16; S 38318: 1; S 38403: 5; S 39667: 19; S 39750: 19; S 39796: 11; S 40211: 4; S 41159: 14; S 41423: 4; S 41895: 4; S 42735: 13; S 42875: 19; S 42934: 19; S 43657: 13; S 44704: 5; S 45548: 16; S 46397: 1; S 46625: 5; S 47646: 11; S 47657: 2; S 47783: 13; S 48364: 19; S 49318: 5; S 49612: 11; S 50107: 4; S 50590: 11; S 50767: 11; S 50903: 11; S 51430: 5; S 53909: 5; S 55270: 19; S 55804: 11; S 55966: 11; S 55968: 11; S 56471: 5; S 56785: 11; S 57220: 15; S 57433: 9; S 57441: 10; S 57789: 5; S 57863: 4; S 58659: 19; S 59021: 1; S 60068: 19; S 61440: 5; S 62161: 4; S 64289: 5; S 64898: 4; S 65472: 6; S 66173: 5; S 66829: 5; S 68074: 13; S 71953: 11; S 73105: 6; S 74442: 5; S 74624: 11; S 76324: 9; S 76964: 13; S 78301: 9; S 80034: 12; S 80093: 12; S 80192: 11; S 80210: 13; S 81713: 5; S 81888: 13; S 87548: 6; S 88004: 14; S 88190: 13; S 91375: 16; S 94780: 5 — S A 906 (Egon): 13 — SAN A 470: 4; SAN A 1147 (Cuadra): 5; SAN A 1309 (Cuadra): 5; SAN A 2264: 5; SAN A 2797(Kadir): 5; SAN A 2892: 5; SAN

A 3302 (Kadir & Jiran): 5; SAN A 3568 (Kadir): 5; SAN A 3874: 1; SAN A 3994: 19; SAN A 4491: 12; SAN A 4765: 10; SAN A 10512 (Enggoh): 5 — SAN 16576: 4; SAN 16856: 5; SAN 17570: 9; SAN 19213a: 5; SAN 20624: 2; SAN 21233: 13; SAN 21279: 5; SAN 21817: 1; SAN 22264: 5; SAN 22827: 9; SAN 23284: 1; SAN 23340: 5; SAN 25343: 1; SAN 25354: 4; SAN 26348: 5; SAN 26484: 4; SAN 27158: 5; SAN 27438: 4; SAN 28365: 5; SAN 29110: 13; SAN 30304: 4; SAN 30650: 2; SAN 31059: 5; SAN 31411: 19; SAN 31614: 5; SAN 31722: 19; SAN 32029: 5; SAN 32859: 19; SAN 33160: 5; SAN 34426: 5; SAN 35088: 5; SAN 35358: 19; SAN 35650: 2; SAN 36546: 5; SAN 36583: 5; SAN 37056: 1; SAN 37165: 19; SAN 37683: 13; SAN 37821: 8b; SAN 38309: 12; SAN 38469: 12; SAN 38508: 13; SAN 38734: 5; SAN 38823: 1; SAN 39269: 2; SAN 40863: 19; SAN 42206: 2; SAN 42400: 5; SAN 43164: 4; SAN 43345: 5; SAN 44718: 5; SAN 46313: 5; SAN 46520: 12; SAN 47327: 1; SAN 47402: 10; SAN 47763: 19; SAN 48181: 1; SAN 48287: 1; SAN 48992: 5; SAN 49248: 10; SAN 50065: 5; SAN 50564: 5; SAN 51016: 1; SAN 52516: 4; SAN 52789: 10; SAN 53552: 5; SAN 53921: 5; SAN 54463: 19; SAN 54576: 19; SAN 55793: 5; SAN 55839: 4; SAN 57104: 2; SAN 57143: 10; SAN 57510: 15; SAN 58090: 5; SAN 58182: 5; SAN 60576: 5; SAN 61467: 4; SAN 62093: 1; SAN 62541: 1; SAN 64101: 8a; SAN 67566: 13; SAN 70344: 13; SAN 71505: 2; SAN 71760: 5; SAN 72002: 2; SAN 72064: 2; SAN 72067: 11; SAN 72771: 5; SAN 74278: 1; SAN 74279: 1; SAN 74338: 13; SAN 74527: 15; SAN 75940: 10; SAN 76177: 12; SAN 76181: 13; SAN 76235: 4; SAN 77929: 19; SAN 78186: 2; SAN 78482: 2; SAN 79487: 2; SAN 79943: 5; SAN 80030: 1; SAN 80201: 2; SAN 80226: 5; SAN 81172: 5; SAN 81642: 5; SAN 81966: 1; SAN 82057: 5; SAN 82412: 11; SAN 84457: 5; SAN 84766: 5; SAN 86368: 1; SAN 86369: 1; SAN 86759: 4; SAN 87194: 11; SAN 87905: 10; SAN 87977: 10; SAN 89151: 5; SAN 90022: 13; SAN 90937: 5; SAN 92438: 5; SAN 93077: 5; SAN 93277: 2; SAN 98060: 8b; SAN 98112: 8b; SAN 98118: 8b; SAN 99879: 2; SAN 100721: 8b; SAN 100729: 8b; SAN 101957: 8b; SAN 102413: 2; SAN 103000: 1; SAN 105188: 1; SAN 106127: 5; SAN 106867: 11; SAN 108848: 2; SAN 110950: 19; SAN 111238: 2; SAN 113851: 13; SAN 114046: 2; SAN 114125: 13; SAN 114150: 2; SAN 114274: 2; SAN 114308: 5; SAN 116415: 13; SAN 116423: 13; SAN 117957: 5; SAN 118442: 13; SAN 118833: 13; SAN 120110: 2; SAN 120336: 11; SAN 122207: 13; SAN 122587: 15; SAN 122626: 11; SAN 122851: 2; SAN 123433: 13; SAN 123918: 5; SAN 123904: 19; SAN 123986: 11; SAN 124769: 2; SAN 125360: 2; SAN 126094: 13; SAN 126440: 1; SAN 128051: 2; SAN 128635: 13; SAN 128848: 5; SAN 129455: 19; SAN 129528: 19; SAN 130104: 13; SAN 130202: 2; SAN 132242: 4; SAN 132805: 18a; SAN 134978: 19; SAN 135198: 2; SAN 136926: 13; SAN 137056: 1; SAN 138834: 12; SAN 138879: 11; SAN 139425: 11; SAN 139568: 13; SAN 141813: 18b; SAN 143457: 18b — Sands *et al.* 5328: 11 — Sathvinderjit SKK 8: 13 — Sato 1099: 12 — Sato

et al. 23: 13 — SFN 27137: 5; SFN 27291: 4; SFN 27686: 13; SFN 27725: 12; SFN 36060: 4; SFN 40926: 5; SFN 11314: 9 — Schultze 35a: 2 — Shashi *et al.* DSD 28: 2 — Sidiyasa *et al.* 1195: 10 — Sinclair & Kadim 9045: 13; 10522: 10 — Slooten 2274: 10 — Soejarto 69: 5 — Soepadmo ES 964: 11 — Soepadmo & Mahmud ES 1049: 11 — Steenis 17393: 5 — Stevens PSF 393: 1; PSF 201: 1 — Stevens *et al.* PSF 482: 13 — Syngé 1893: 3.
 Tagawa *et al.* 321: 5 — Tandom BNB 4822: 1 — Teo & Din KL 4950: 14, KL 4940: 5 — Teo & Remy KL 4086: 5 — Teysmann *s.n.*: 1.
 Van Balgooy 4022: 5.
 Wallich Cat. 2584b: 13 — Webb 715: 1 — Webb *et al.* MB 159: 13 — Wong WKM 20: 1; WKM 36: 1; WKM 68: 5; WKM 144: 1; WKM 163: 1; WKM 835: 5; WKM 1116: 1; WKM 1368: 11 — Wong & Dransfield WKM 499: 9 — Wood 761: 1 — Wong & Wyatt-Smith W 81: 11 — Wray 280: 13.
 Yabainus *et al.* SP 16287: 13.
 Zainuddin AZ 17: 2; AZ 4918: 2; AZ 4984: 1 — Zainuddin *et al.* AZ 5674: 10 — Zazmee ZASZ 3: 2.

List of basionyms, synonyms and accepted names of *Actinodaphne* species in Sabah and Sarawak

Basionyms and synonyms are given in *italic* and the accepted names in **bold and italic**.

- A. borneensis* Meisn.
- A. concinna* Ridl. = ***A. pruinosa*** Nees
- A. diversifolia* Merr.
- A. foxworthyana* Gibbs = ***A. oleifolia*** Gamble
- A. fuliginosa* Airy Shaw
- A. gelonioides* Ridl. = ***A. oleifolia*** Gamble
- A. glabra* Blume
- A. glomerata*** (Blume) Nees
- A. johorensis* Gamble
- A. kinabaluensis* Kosterm.
- A. kostermansii* var. *glabrescens* S. Julia
- A. kostermansii* var. ***kostermansii***
- A. macrophylla*** (Blume) Nees
- A. maingayi* Hook.f. = ***A. macrophylla*** (Blume) Nees
- A. maingayi* Hook.f. var. *macrocarpa* Gamble = ***A. glomerata*** (Blume) Nees
- A. myriantha* Merr.
- A. oleifolia*** Gamble
- A. percoriacea* S. Julia
- A. pruinosa*** Nees
- A. pruinosa* Nees var. *kunstleri* Gamble = ***A. pruinosa*** Nees
- A. robusta* S. Julia
- A. semengohensis* S. Julia
- A. sesquipetalis* Hook.f. & Thoms. var. *macrocarpa* (Gamble) Ridl. = ***A. glomerata*** (Blume)

Nees

A. soepadmoi S. Julia

A. spathulifolia S. Julia

A. sulcata S. Julia var. *longipetiolata* S. Julia

A. sulcata S. Julia var. *sulcata*

A. venosa S. Julia

Litsea glomerata Blume = *A. glomerata* (Blume) Nees

Litsea macrophylla Blume = *A. macrophylla* (Blume) Nees